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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/387,477

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Manabu Tomita

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10/19/2004

TEXAS INSTRUMENTS INCORPORATED
P O BOX 655474, M/S 3999
DALLAS, TX 75265

EXAMINER

GUERRERO, MARIA F

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 10/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/387,477

Applicant(s)

TOMITA ET AL.

Examiner

Maria Guerrero

Art Unit

2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 August 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-7 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-7 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. This Office Action is in response the Appeal Brief filed August 2, 2004. The Finality of Office Action filed April 5, 2002 has been withdrawn in view of new applied references.

Status of Claims

2. Claims 2 and 8-9 are canceled. Claims 1 and 3-7 are pending.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1 and 3-7 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The specification does not provide support for the new limitation "the fluorocarbon gas having the lower ratio of carbon atoms to fluorine atoms forming at least one half of the mixed gas". The specification recites: "in which equal quantities or less of a second fluorocarbon gas with a small C/F ratio to a first fluorocarbon gas with large C/F ratio are mixed is used". The original claim 2 does not provide support because the original claim 2 recited: "the aforementioned mixed gas where equal amounts or less of a second fluorocarbon gas

with a small C/F ratio to a first fluorocarbon gas with a large C/F ratio are mixed". The original specification and original claims described the second fluorocarbon gas with the small C/F ratio being equal or less to the first fluorocarbon gas with large C/F ratio.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 3 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 3 recites "wherein C₄F₈ is used as the fluorocarbon gas having a lower ratio of carbon atoms to fluorine atoms and at least one selected from the group composed of CHF₃, CH₂F₂ and CF₄ is used as the fluorocarbon gas having higher ratio of carbon atoms to fluorine atoms". The claim is vague and indefinite because the specification describes C₄F₈ as the fluorocarbon gas having the higher ratio of carbon atoms to fluorine atoms and CHF₃, CH₂F₂ and CF₄ as the fluorocarbon gas having the lower ratio of carbon atoms to fluorine atoms (pages 3-4, page 6, lines 1-10, page 7, lines 9-27).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1 and 4 are rejected under 35 U.S.C. 102(b) as being anticipated by Yanagida (U.S. 5,338,399).

Yanagida teaches providing a semiconductor substrate having a lower electrically conducting layer (2) thereon and an electrically insulating layer (3) disposed over the electrically conducting layer (2) (Fig. 1a, col. 8, lines 15-20). Yanagida shows providing a gas etchant comprising a mixed gas of multiple different fluorocarbon gases, each fluorocarbon gas having a different ratio of carbon atoms to fluorine atoms that have different ratios of carbon atoms to fluorine atoms (col. 11, lines 5-20, 38-43). Yanagida discloses the fluorocarbon gas having the lower ratio of carbon atoms to fluorine atoms forming at least one half of the mixed gas (col. 11, lines 38-43). Yanagida teaches etching a connection hole through the electrically insulating layer in a single etching step to the electrically conducting layer using only the mixed gas as the etchant

Art Unit: 2822

(Fig. 1b, col. 11, lines 5-20, 38-43). Yanagida shows the insulating layer being plasma etched with the mixed gas of fluorocarbon gases (col. 11, lines 60-62).

5. Claims 1 and 3-4 are rejected under 35 U.S.C. 102(e) as being anticipated by Park (U.S. 6,103,137).

Park teaches providing a semiconductor substrate having a lower electrically conducting layer thereon and an electrically insulating layer disposed over the electrically conducting layer (Fig. 3D, col. 4, lines 15-25). Park shows providing a gas etchant comprising a mixed gas of multiple different fluorocarbon gases, each fluorocarbon gas having a different ratio of carbon atoms to fluorine atoms that have different ratios of carbon atoms to fluorine atoms (Abstract, col. 3, lines 40-65). Park discloses the fluorocarbon gas having the lower ratio of carbon atoms to fluorine atoms forming at least one half of the mixed gas (col. 3, lines 40-65). Park teaches etching a connection hole through the electrically insulating layer in a single etching step to the electrically conducting layer using only the mixed gas as the etchant (Fig. 3F-3G, col. 4, lines 20-26). Park shows the insulating layer being plasma etched with the mixed gas of fluorocarbon gases (Abstract, col. 3, lines 30-45).

Regarding claim 3, as understood by the Examiner, Park teaches using C_4F_8 as the fluorocarbon gas having the higher ratio of carbon atoms to fluorine atoms and at least one of CHF_3 and CH_2F_2 as the fluorocarbon gas having the lower ratio of carbon atoms to fluorine atoms (col. 3, lines 40-65).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yanagida (U.S. 5,338,399) in view of Mizuhara et al. (U.S. 5,898,221).

Regarding claims 5-7, Yanagida does not specifically show the upper electrically conducting layer (electrode or wiring) connected to the lower electrically conducting layer. Yanagida does not specifically show the lower conducting layer having a titanium nitride layer, a layer of aluminum, a titanium layer and a titanium nitride layer stacked in that order. Yanagida does not specifically show the electrically insulating having the silicon oxide layer formed from TEOS, the spin-on glass layer, and the silicon oxide formed from TEOS stacked in that order. However, Mizuhara et al. shows the upper electrically conducting layer (electrode or wiring) connected to the lower electrically conducting layer (Fig. 9, col. 5, lines 5-9). Mizuhara et al. teaches the lower conducting layer having a titanium nitride layer, a layer of aluminum, a titanium layer and a titanium nitride layer stacked in that order (Fig. 3, 8-9, col. 3, lines 37-40). Mizuhara et al. discloses the electrically insulating having the silicon oxide layer formed from TEOS, the spin-on glass layer, and the silicon oxide formed from TEOS stacked in that order (Fig. 7-8, col. 4, lines 25-60).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Yanagida reference by including the specific configuration suggested by Mizuhara et al. in order to provide a multiplayer wiring structure having low pollution, low damage and improved reliability (Mizuhara et al., col. 1, lines 5-12; Yanagida, col. 3, lines 50-54).

Response to Arguments

7. Applicant's arguments with respect to claims 1 and 3-7 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Guerrero whose telephone number is 571-272-1837.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 571-272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2822

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MG

October 13, 2004


AMIR ZARABIAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800